

REMARKS

The specification has been amended to correct an obvious typographical error.

The headings below are numbered to correspond with the heading numbering used by the Examiner in the Office Action.

4-5) Claims 5, 20 and 29 satisfy 35 U.S.C. 112, second paragraph.

The Examiner states:

... claim 5 recites "the same join instructions of said join instructions after said scheduling as before said scheduling" as being indefinite in that it fails to point out what is included or excluded by the claim language. (Office Action, page 2.)

The Examiner's statement is respectfully traversed. As set forth in Applicant's specification at page 11, line 18 to page 12, line 2:

From remapping operation 604, in instruction mapped to same join instruction operation 606, a determination is made whether the instruction is mapped to the same join instruction as before the instructions were scheduled within the trace block. If the instruction is mapped to the same join instruction, then process flow moves to more instructions operation 608. However, if the instruction is not mapped to the same join instruction, then process flow moves to determine operation 610.

In this embodiment, instruction 112 was mapped to join instruction 302 before the instructions were scheduled within trace block 300 as illustrated in FIG. 3. Since instruction 112 is mapped to join instruction 302 after the instructions were scheduled within trace block 300 as illustrated in FIG. 5, instruction 112 is mapped to the same join instruction, i.e., join instruction 302, as before the instructions were scheduled within trace block 110. Thus, process flow moves from instruction mapped to same join instruction operation 606 to more instructions operation 608.

Applicant notes that Claim 5 recites:

The method of Claim 4 wherein said correcting errors further comprises **determining whether said instructions are mapped to the same join instructions of said join instructions after said scheduling as before said scheduling.** (Emphasis added.)

Applicant respectfully submits that one of skill in the art would understand what is being claimed in Claim 5 when read in light of the specification. Accordingly, Claim 5 satisfies 35 U.S.C. 112, second paragraph. Claims 20 and 29 satisfy 35 U.S.C. 112, second paragraph, for reasons similar to Claim 5.

For the above reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

6-7) Claims 1-2, 9, 13, 16, 17, 24-26 are patentable over Brauch et al. (6,526,572) in view of Soltis, Jr. et al. (6,651,164) further in view of Subramanian et al. (5,867,711).

With regards to Claim 1, the Examiner admits:

Brauch ... **does not mention 'disregarding data dependencies'** specifically ... . (Office Action, page 3, emphasis added.)

In contrast to disregarding data dependencies, Brauch et al. teaches that dependencies are considered. Specifically, Brauch et al. teaches:

In a preferred embodiment, **the ability to move an instruction so that it executes earlier in the instruction stream depends upon the dependency relationships of that instruction.** As the mechanism scans through the instruction stream, **it preferably constructs a dependency graph indicating the relationship of the instructions to one another.** Whenever a dependency exists between two instructions, the mechanism assigns an upward path length to the dependent instruction which is equal to the upward path length of the parent instruction added to the length of the dependency. For each instruction, the mechanism preferably performs the optimizing operation under consideration only if doing so would reduce that

instruction's upward path length. (Col. 6, lines 1-13, emphasis added.)

Since Brauch et al. teaches that dependencies are considered, Brauch et al. teaches away from disregarding data dependencies and one of skill in the art would have no motivation to modify Brauch et al. to disregard data dependencies as asserted by the Examiner.

Further, in contrast to the Examiner's assertion, both Soltis, Jr. et al. and Subramanian et al. teach that dependencies are considered.

More particularly, with regards to Soltis, Jr. et al., the Examiner states:

In Soltis, column 1, lines 37-46, "A 'read-after-write data dependency' exists when one instruction to be executed by a processor utilizes, during execution, data retrieved or produced from the execution of another instruction. If the one instruction executes before the other instruction executes (*disregarding dependencies*), then an **error may occur**, since the one instruction may utilize incorrect data during execution. As a result, to **prevent errors**, steps should be taken to ensure that the instruction utilizing data retrieved or produced from the execution of another instruction does not execute until the necessary data from execution of the other instruction is available. (*correcting errors*)". (Office Action, pages 3-4, emphasis in original.)

Accordingly, Soltis, Jr. et al. teaches that if dependencies are disregarded, an error may occur. Thus, to prevent the errors from occurring in the first place, the dependencies are considered, i.e., "steps should be taken to ensure that **the instruction utilizing data retrieved or produced from the execution of another instruction** does not execute until the necessary data from execution of the other instruction is available", emphasis added.

The Examiner asserts that this is "correcting errors". However, as set forth above, the dependencies are considered to

prevent the errors from occurring at all. Thus, the Examiner has failed to callout where Soltis, Jr. et al. teaches or suggests that the errors are allowed to occur and then corrected as asserted by the Examiner.

With regards to Subramanian et al., the Examiner states:

In Subramanian FIG. 3, it does scheduling first (*disregarding dependency*), and in FIG. 4. it then does the dependency analysis. (Office Action, page 4, emphasis in original.)

The Examiner's statement is respectfully traversed. Subramanian et al. teaches that FIG. 4 is the instruction scheduling portion of FIG. 3, i.e., FIG. 4 is a portion of FIG. 3. Specifically, Subramanian et al. teaches:

FIG. 3 illustrates a large scale organization of a code optimizer. **FIG. 4 illustrates an organization of the Instruction Scheduling portion of FIG. 3** as typical in the Prior Art use of modulo scheduling. (Col. 3, lines 18-22, emphasis added.)

With reference to FIG. 4, Subramanian et al. teaches that dependencies are considered in scheduling instructions. Specifically, Subramanian et al. teaches:

Referring now to FIG. 4, a general flow chart of the prior art Optimizing Compiler Modulo Scheduling operation is depicted 100. Upon entry to this section of the Optimizing Compiler 102 **incoming intermediate data is processed and the data representing a loop is used to construct a Data Dependency Graph (DDG) 104. Using this DDG the scheduler determines a theoretical maximum throughput possible for this loop, given all the data dependencies and the resource requirements 106. That is, considering the data dependencies of each instruction and the resource requirements ... a calculation is made to determine the minimum iteration interval (mii) and the recurrence minimum iteration interval (rmii). Next all instructions in the loop are scheduled obeying the modulo constraint 108.** (Col. 5, lines 28-43, emphasis added.)

For at least the above reasons, Brauch et al., Soltis, Jr. et al. and Subramanian et al., alone or in combination, do not teach or suggest:

A. method comprising:  
building a trace comprising instructions;  
building a trace block comprising said instructions;  
**scheduling said instructions within said trace block disregarding data dependencies from any off trace basic blocks**, wherein at least one of said instructions is moved during said scheduling; and  
**correcting errors due to said at least one of said instructions being moved,**

as recited in Claim 1, emphasis added. Accordingly, Claim 1 is allowable over Brauch et al. in view of Soltis, Jr. et al. and further in view of Subramanian et al. Claim 2, which depends from Claim 1, is allowable for at least the same reasons as Claim 1.

Claims 9, 16, 24, and 25 are allowable for reasons similar to Claim 1. Claim 13, which depends from Claim 9, is allowable for at least the same reasons as Claim 9. Claim 17, which depends from Claim 16, is allowable for at least the same reasons as Claim 16. Claim 26, which depends from Claim 25, is allowable for at least the same reasons as Claim 25.

For the above reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

8) Claims 3-5, 18-20, and 27-29 are patentable over Brauch et al. in view of Soltis, Jr. et al. further in view of Subramanian et al. and further in view of Emer et al. (6,449,713).

As set forth above, Claims 1, 16, and 25 are allowable over Brauch et al. in view of Soltis, Jr. et al. and further in view of Subramanian et al. Claims 3-5, 18-20, and 27-29, which depend from Claims 1, 16, and 25, respectively, are allowable over Brauch et al. in view of Soltis, Jr. et al. and further in view of Subramanian et al. for at least the same reasons as Claims 1, 16, and 25.

Emer et al. does not cure the previously described deficiencies in Brauch et al., Soltis, Jr. et al. and Subramanian et al. Accordingly, Claims 3-5, 18-20, and 27-29 are allowable over Brauch et al. in view of Soltis, Jr. et al. further in view of Subramanian et al. and further in view of Emer et al.

For the above reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

9) Claims 6, 10, 21 and 30 are patentable over Brauch et al. in view of Soltis, Jr. et al. further in view of Subramanian et al. and further in view of Fleck et al. (6,076,159).

As set forth above, Claims 1, 9, 16, and 25 are allowable over Brauch et al. in view of Soltis, Jr. et al. and further in view of Subramanian et al. Claims 6, 10, 21, and 30, which depend from Claims 1, 9, 16, and 25, respectively, are allowable over Brauch et al. in view of Soltis, Jr. et al. and further in view of Subramanian et al. for at least the same reasons as Claims 1, 9, 16, and 25.

Fleck et al. does not cure the previously described deficiencies in Brauch et al., Soltis, Jr. et al. and Subramanian et al. Accordingly, Claims 6, 10, 21, and 30 are allowable over Brauch et al. in view of Soltis, Jr. et al. further in view of Subramanian et al. and further in view of Fleck et al.

For the above reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

10) Claims 7, 11, 12, 22 and 31 are patentable over Brauch et al. in view of Soltis, Jr. et al. further in view of Subramanian et al. and further in view of Fleck et al. and further in view of Hayashi (5,828,886).

As set forth above, Claims 6, 10, 21, and 30 are allowable over Brauch et al. in view of Soltis, Jr. et al. further in view of Subramanian et al. and further in view of Fleck et al. Claims 7, 11-12, 22 and 31, which depend from Claims 6, 10, 21, and 30, respectively, are allowable over

Brauch et al. in view of Soltis, Jr. et al. and further in view of Subramanian et al. and further in view of Fleck et al. for at least the same reasons as Claims 6, 10, 21, and 30.

Hayashi does not cure the previously described deficiencies in Brauch et al., Soltis, Jr. et al., Subramanian et al. and Fleck et al. Accordingly, Claims 7, 11-12, 22 and 31 are allowable over Brauch et al. in view of Soltis, Jr. et al. further in view of Subramanian et al. and further in view of Fleck et al. and further in view of Hayashi.

For the above reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

11) Claims 8, 14, 15, 23 and 32 are patentable over Brauch et al. in view of Soltis, Jr. et al. further in view of Subramanian et al. and further in view of Lueh (2003/0079211).

As set forth above, Claims 1, 9, 16, and 25 are allowable over Brauch et al. in view of Soltis, Jr. et al. and further in view of Subramanian et al. Claims 8, 14-15, 23 and 32, which depend from Claims 1, 9, 16, and 25, respectively, are allowable over Brauch et al. in view of Soltis, Jr. et al. and further in view of Subramanian et al. for at least the same reasons as Claims 1, 9, 16, and 25.

Lueh does not cure the previously described deficiencies in Brauch et al., Soltis, Jr. et al. and Subramanian et al. Accordingly, Claims 8, 14-15, 23 and 32 are allowable over Brauch et al. in view of Soltis, Jr. et al. further in view of Subramanian et al. and further in view of Lueh.

For the above reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

### Conclusion

Claims 1-32 are pending in the application. For the foregoing reasons, Applicant respectfully requests allowance of all pending claims. If the Examiner has any questions relating

Appl. No. 10/043,772

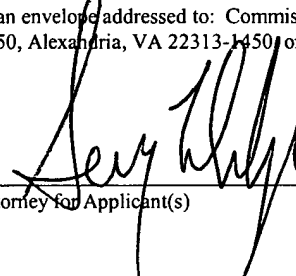
Amdt. dated February 11, 2005

Reply to Office Action of November 30, 2004

to the above, the Examiner is respectfully requested to  
telephone the undersigned Attorney for Applicant(s).

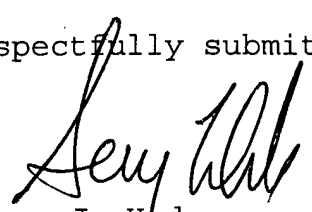
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Attorney for Applicant(s)

February 11, 2005  
Date of Signature

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